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17. ABSTRACT (MAX. 250 WORDS)

A sample reading unit in science is presented for disadvantaged students at three levels of ability. The reading lesson is complete with illustrations of electromagnets. Following the supplementary unit are three sample objective tests for the different ability levels. Each set of questions is designed both to test knowledge of science facts gained in reading the lesson and to emphasize language arts skills using words found in the unit. The English skills emphasized include alphabetizing, forming plural words, adding word prefixes and suffixes, syllabification, and use of the dictionary. Such a supplementary reading unit serves as an aid in teaching both science and the language arts.

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INFORMATION RETRIEVAL CENTER ON THE DISADVANTAGED
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THE ELECTROMAGNET

A SUPPLEMENTARY READING UNIT IN SCIENCE

Prepared Jointly By:

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Districts 1,2,3,4
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Education

and

The Mobilization for Youth, Curriculum
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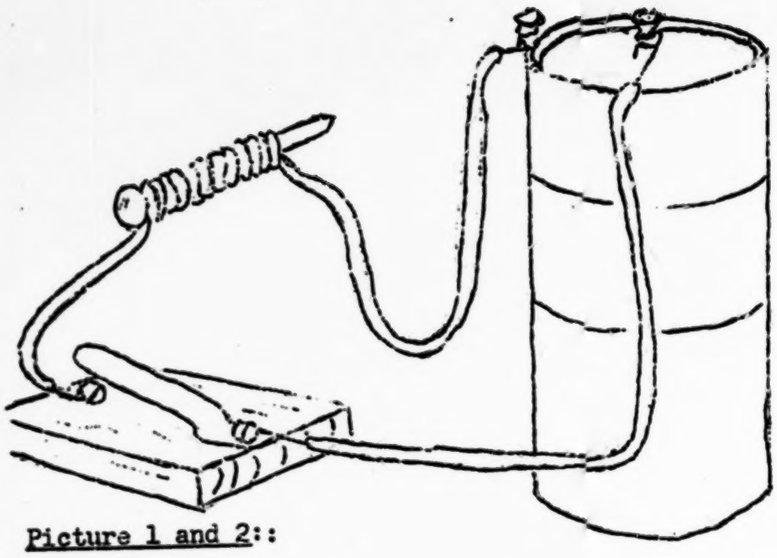
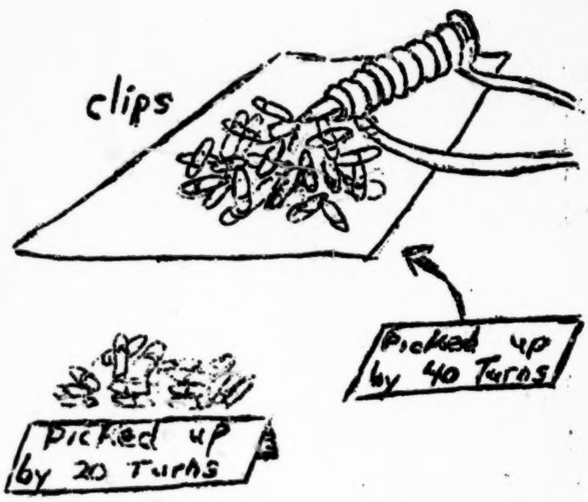




Picture 1 and 2::

We made an electromagnet.
We used a very big iron nail.
We used a switch.
We used dry cells.
We used one long covered wire.
We used one short covered wire.
We made the ends of the wires bare.
We turned the long wire around the nail.
We put one end of the long wire on the switch.
We put the other end on one pole of the dry cell.
We did this to the short wire, too.

We used our magnet.
We closed the switch.
We put the big nail or electromagnet near the clips.
The big nail picked up the clips.
We wound more wire around the big nail.
The big nail picked up more clips.

Picture 1 and 2:

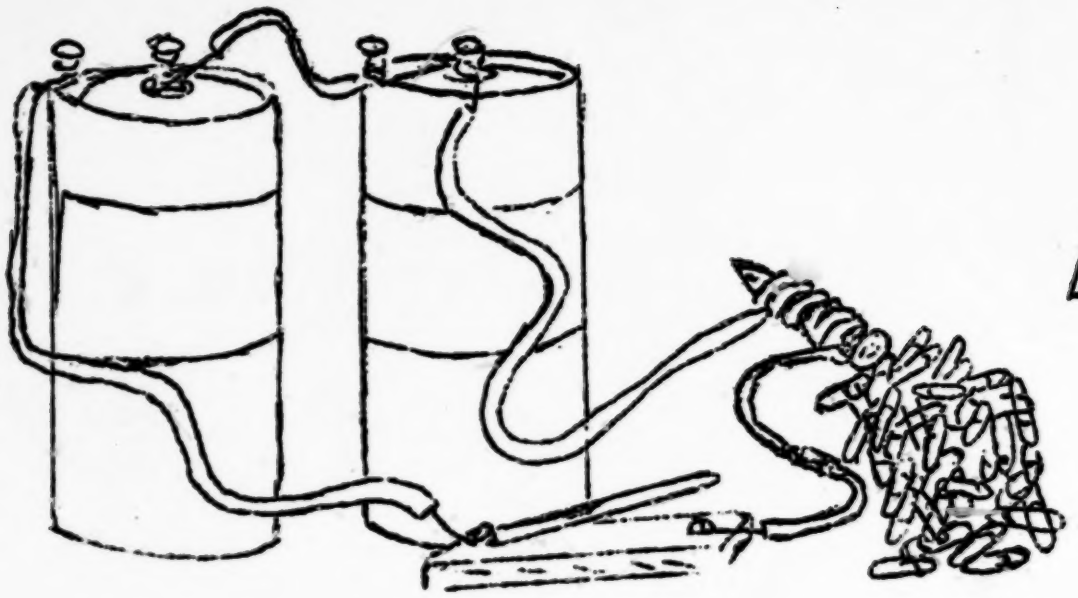
We have made an electromagnet.
We needed a long iron nail, a switch and a dry cell.
We also needed two pieces of covered wire, one long and one short..
We took one inch of the covering off each end of the wire.
We wound the long wire around the iron nail ten times.
We connected one end of the long wire to both the switch and one pole of the dry cell.
We connected the short wire to the other pole of the dry cell and to the other side of the switch.
We used the switch to open and close the circuit.

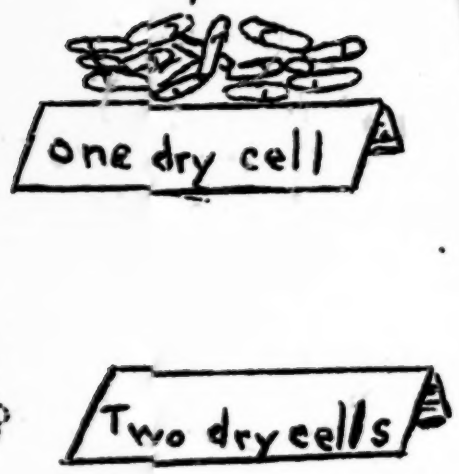
By pressing the switch we completed a circuit. We placed our finished electromagnet near the pile of clips and it picked up a few clips. When we wound more wire around the nail, the electromagnet became stronger. When we placed the stronger electromagnet near the pile of clips it picked up many more clips than it did before.

Picture 1 and 2:

First we stripped the ends of the long insulated wire and wound it around the nail. We then connected one end of it to a terminal screw of a dry cell and the other to a switch. In order to complete the circuit, we connected the short wire to the other terminals.
The electricity needed to give us the electromagnetic power was supplied by the dry cell. The switch helped us control the power by turning it on or off as needed.

We placed a pile of clips on the desk and tried to pick them up with the nail while the switch was open. The nail or electromagnet did not attract any clips.
Then we tried the same thing with the switch closed. This time we did succeed in lifting the clips. From this we concluded that the nail is a magnet only when the switch is closed, and the electric current is flowing through the circuit.
When we doubled the number of turns of wire on the nail we found that we were able to pick up many more clips.





Picture 4:

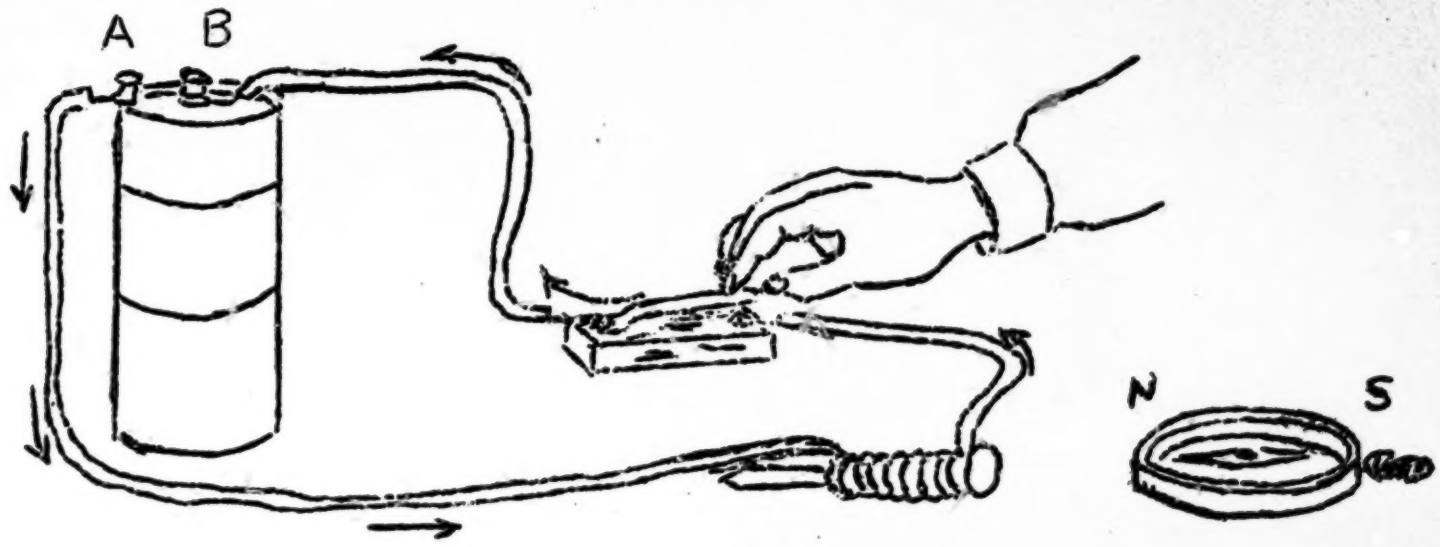
Then we used two dry cells.
We did not wind any more wire around the nail.
Two dry cells made the electromagnet pull harder.
Two dry cells made the electromagnet stronger.

Picture 4:

We did another experiment.
We used two dry cells.
We connected the dry cells to each other.
We didn't windany more wire around the nail.
Two dry cells made the electromagnet stronger.
We saw this was true when we picked up more clips.
This is another way to make the electromagnet stronger.

Picture 5:

As curious scientists, we then experimented by adding another dry cell. We were careful to connect the outside terminal of one with the inside of the other. We were surprised to discover that the extra dry cell made our electromagnet more powerful, even though we did not increase the number of turns of wire around the nail.
Thus we found that we could increase the lifting power of the electromagnet by either increasing the number of turns of wire around the nail or by adding dry cells.



Picture 5: .

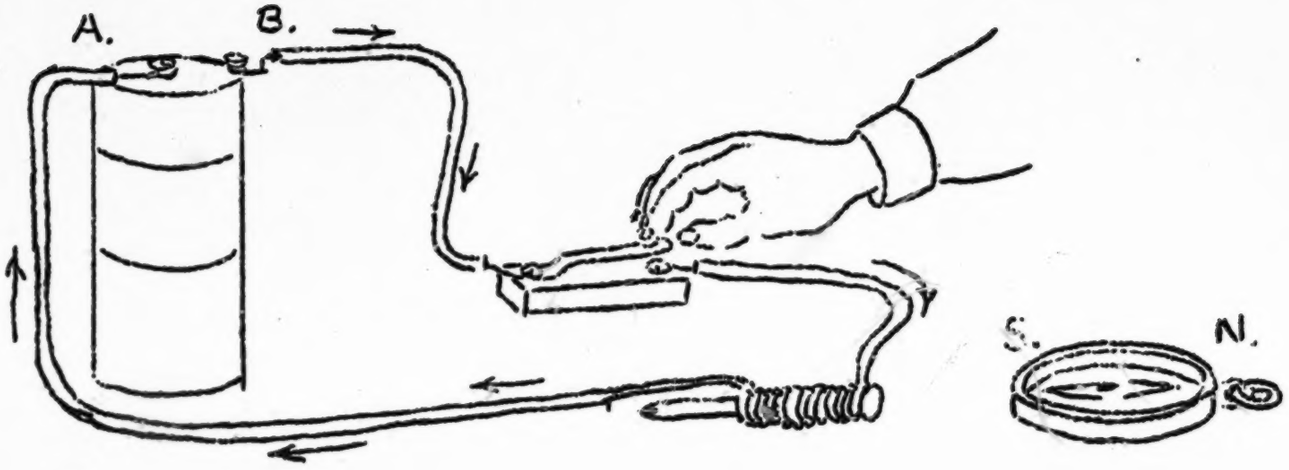
All magnets have two poles.
Electromagnets have two poles also.
We used a compass to find this out.
We put the electromagnet near the compass.
The north pole of the compass pulled to the south pole of the electromagnet.
The south pole of the compass pulled to the north pole of the electromagnet.

Picture 5:

We know that our electromagnet, like other magnets, has two poles.
We saw that a compass has two poles, a north pole and a south pole.
We pressed the switch and completed the circuit.
We found that the north pole of the compass was attracted to the head of the nail. This showed us that the head of the nail or electromagnet is a south pole.

Picture 5: .

You already know from your study of magnets that opposite poles attract, while like poles repel. This experiment showed the same is true for electromagnets.
When we placed the compass near the electromagnet, the north pole of the compass was attracted to the head of the nail. This showed that the head of the nail was a south pole.



Picture 6:

We took wire 1 off pole A.
We put it on pole B.
We took wire 2 off pole B.
We put it on pole A.
This made the current go the other way.
Then the north pole of the electromagnet became the south pole.
The south pole of the electromagnet became the north pole.
The compass showed this.

Picture 6:

In our last experiment we discovered which was the north pole and south pole of our electromagnet.
The next thing we did was to change the wires on the screws of the dry cell. We took wire one (1) off pole A and put it on pole B. Then we took wire two (2) off pole B and put it on pole A.
This changed the direction of the flow of electricity. Our compass showed us that the head of the nail became a north pole and the point of the nail became a south pole.

Picture 6:

Continuing our experiment, we reversed the connection of the wires to the terminals in order to make the electricity flow in an opposite direction.
We observed that the north pole of the compass immediately moved away from the head of the nail. The head of the nail was changed from a south pole to a north pole.
This happened because we changed the direction in which the electricity flowed.

CONCLUSION SUMMARY LEVEL A

We found out many things about electromagnets and electricity.

We know that we need a switch to open and close the circuit.

We used a big nail for our electromagnet.

We used covered wire.

We need a dry cell to make an electromagnet.

Two dry cells make the electromagnet stronger.

More wire around the nail also makes the electromagnet stronger.

We found out that an electromagnet has two poles.

One pole is the north pole. The other pole is the south pole.

Now how are electromagnets used?

On your way to school today, you saw cars and buses.

Cars and buses use electromagnets.

Electromagnets help them work.

At home you hear the radio.

At home you see the electric clock.

Electromagnets make them work too.

You hear the school bell ring in the morning.

An electromagnet helps make the bell ring.

Electromagnets help us in many ways.

CONCLUSION SUMMARY LEVEL B

We know how to make an electromagnet.

We pick up things made of iron while the circuit is closed and the electricity flows through the wire.

When the circuit is opened the electricity does not flow through the wire and our magnet is unable to work. It no longer can pick up clips.

We can make the electromagnet stronger if we wind more wire around the nail.

We can make the electromagnet stronger if we use two dry cells.

Electromagnets, like other magnets, have a south pole and north pole.

We use electromagnets for many things.

We see electromagnets at work every day.

When we stop for a red light at the corner of Delancey Street we see many electromagnets at work.

We see cars coming from Brooklyn.

We see buses on the Williamsburgh Bridge.

We see trucks crossing Clinton Street.

They all use electromagnets.

Electromagnets are used in everyday living.

They are used at home.

Electromagnets are used in radios, television sets, toaster, and telephone.

We use electromagnets in our school.

Electromagnets are used in filmstrip projectors, television sets, and movie projectors.

Electromagnets are everywhere!

CONCLUSION SUMMARY LEVEL C

When electricity flows through an insulated wire that is wound around a soft iron core, the core becomes a magnet. In our experiment electricity was supplied by a dry cell while a nail served as a soft iron core.

When the electricity is turned off, the core is no longer a magnet. Increasing the number of turns of wire around the core, or adding dry cells, increases the strength of the electromagnet.

Electromagnet, like other magnets, have a north and south pole.

Electromagnets are an important part of our daily lives. On any weekday morning, cars, buses and subways carry people to work and to school. These vehicles come from Brooklyn, and Queens across the Williamsburgh and Manhattan Bridges. All of these vehicles employ electromagnets, to help make them operate.

At home, mother has made toast on the electric toaster. She turns off the television when the electric clock on the well tells her that it is time for the children to go to school. Electromagnets make these things work too.

At school, electromagnets are at work. They are used in radios, movie projectors and school bells.

These unseen electromagnets are like magicians, providing the magical power of electric current.

SUPPLEMENTARY: IEVEL A

Many years ago men found out about electricity and magnets.

Here are the names of some of these men: William Sturgeon, Michael Faraday, and Hans Oersted.

SUPPLEMENTARY: LEVEL B

Many years ago men found out about electricity and magnetism. In 1820, William Sturgeon made the first electromagnet. Michael Faraday found many new and important uses for the electromagnet. He developed electric generators and motors.

In days to come we can expect an even wider use of electromagnets.

SUPPLEMENTARY: LEVEL C

For more than 1500 years men have been discovering more and more of the secrets of electricity and magnetism just as you have been doing in your own classroom.

But the crucial discovery, that an electric current flowing through a wire gives the wire magnetic power, did not come until 1820. It was at this time that a Danish scientist and teacher by the name of Hans Oersted accidentally found this out in his laboratory.

Soon after this startling event, an Englishman, William Sturgeon, linked electricity and magnetism together by actually making an electromagnet. He placed a piece of iron inside a coil of wire and sent an electric current through the wire. The iron, of course, became an electromagnet--the world's first.

This did not satisfy another scientist, a native New Yorker, Joseph Henry. He went ahead and developed stronger electromagnets.

Then came the great electromagnetic inventions of Michael Faraday which were used in operating electric generators and electric motors.

In our time we can expect to see an even wider use of electromagnets in our daily lives and in our nation's industries.

LANGUAGE ARTS LEVEL A

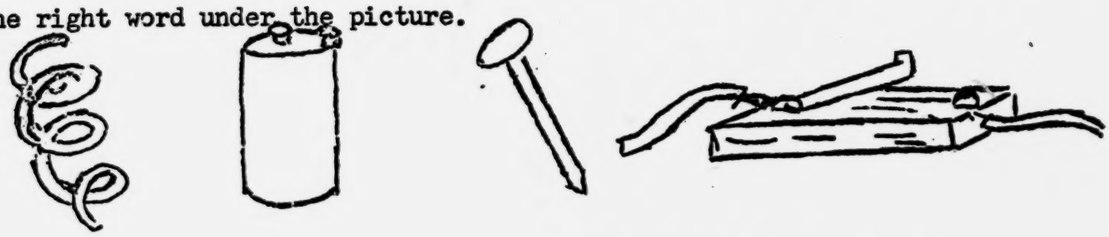
1. Look at the first letter of each word
The words are not in the order of the alphabet.
Put the words in the right order.

around
wire
dry
iron
cell
electricity
switch
pole
nail

a	h	o	u
b	i	p	v
c	j	q	w
d	k	r	x
e	l	s	y
f	m	t	z
g	n		

FIRST LEVEL

II. Put the right word under the picture.



III. Put these sentences in the order in which we did the work.

1. closed the switch
2. turned wire around the nail
3. connected the dry cell
4. made the ends of the wire bare
5. picked up clips

1.

2.

3.

4.

5.

IV. Write 3 words beginning with the same sound as:

compass	cell
1.	1.
2.	2.
3.	3.

V. Put the last letter on these words.

nai_ iro_
cli_ dr_
magne_

LEVEL A - WORKSHEET SCIENCE

Read the sentence.
Find the right word.
Put it on the line.

1. Electricity goes along a path
   The path is called a _____.
   switch, circuit

2. It opens the circuit
   It closes the circuit.
   It is a _____.
   switch, electromagnet

3. It sends electricity through the wires
   It is a _____ cell
   circuit, dry

4. We wound _____ around the nail
   wire, iron

5. It picks up clips
   We made it in class
   It is an _____.
   wire, electromagnet.

6. It shows north and south
   It is a _____.
   compass, dry cell

7. More turns of _____ on our nail made our electromagnet stronger.
   wire, cell

8. Two dry cells made our electromagnet _____.
   stronger, weaker

SUGGESTED WORK SHEETS -LEVEL B - READING SKILLS

1. Using new words

New Words

Electromagnet
radio
magnet
dry
nail

a. Read your new words
b. Write your new words on these lines.

_____

_____

_____

_____

_____

c. Write the longest word in this line _____.

Write the shortest word on this line _____.

Write the six letter word on this line _____.

Write the word beginning with r on this line _____.

Write the word which ends with l on the line. _____.

II. Plurals

Ones and twos _____ complete these sentences.

1. a. I made one electromagnet.
   b. I made two _____.

2. a. I turned on one switch.
   b. I turned on two _____.

3. a. I used one nail.
   b. I used two _____.

4. a. I turned on one radio.
   b. I turned on two _____.

III. Adding ed, ing

Put the right ending on the word use

a. We can use a nail to make an electromagnet
b. Yesterday we use ____ a nail to make an electromagnet.
c. Now we are use _____ a nail to make an electromagnet.

IV. Mark the long vowels in the words below.

radio iron
pole open
wire

V. Mark the short vowels in the words below

class switch
compass open
magnet

VI. Write the word which has the opposite meaning of these words.

1. North _____
2. near _____
3. long _____
4. dry _____
5. strong _____

VII. Alphabetizing

Look at the first letter of each word. Put each word in the right box.

1. electromagnet	5. switch	9. magnet	13. two	17. open
2. nails	6. gas	10. north	14. flows	18. back
3. wire	7. iron	11. know	15. around	19. pole
4. circuit	8. radio	12. dry	16. jet	20. heat

A - G	H - N	O - T	V - Z

WORK SHEETS - SCIENCE LEVEL B

1. Fill in the blanks with the correct word.

1. Electricity _____ through the wires.
2. We used a _____ cell.
3. Our electromagnet picked up _____.
4. The _____ turns the electricity on and off.
5. We made an _____

flows, moves
wet, dry
clips, nail
switch, device
electromagnet, circumference

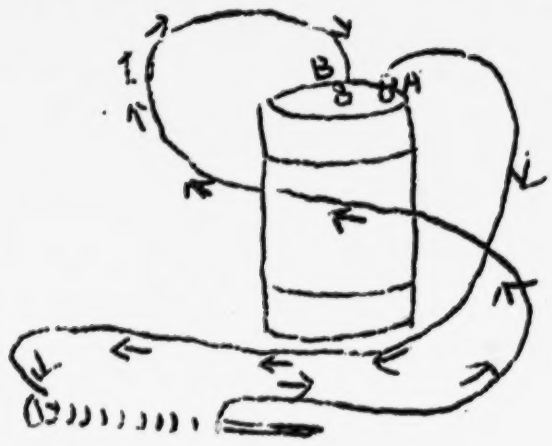
II. Pick the right word for the space.

1. The North Pole of the _____ turned to the South pole of the electromagnet (comes, compass, clothes)
2. We wound wire around an _____nail. (into, iris ., iron)
3. We made the ends of the _____ bare. (wind, wire, wide)
4. The electromagnet has a north and a south _____ (pail, pole, pile)
5. We pressed the switch to complete the _____. (circus, circuit, curtain)

III. Complete the following.

1. Two dry cells made the electromagnet.
2. We made the electromagnet stronger by more turns of _____.
3. The electromagnet has two _____.
4. Our nail was made of _____.
5. We used a _____ to find the north pole.

IV. Using the diagram list the steps by which we made the current of electricity go the other way (Include Diagram 6)



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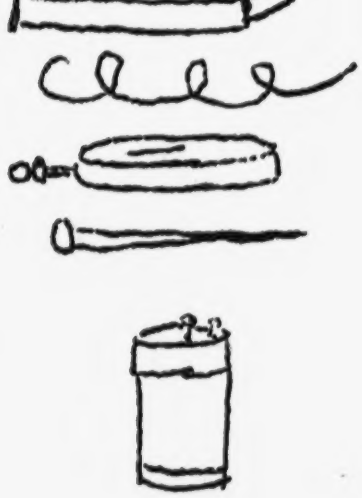
V. Match the word with the picture.

Word	Picture
switch	
nail	
wire	
dry cell	
compass	



LANGUAGE ARTS WORKSHEET LEVEL C

1. Can you identify the prefex, suffix and root in any of these words? Underline the prefix once, root twice, and suffix three times.

   lifting
   observe

2. According to the story for picture 3, place these items in order, numbering them from one to five.

   Doubled the number of turns of wireon the nail
   The switch was closed
   The switch was open
   The electromagnet did not attract nails
   The electromagnet did lift nails.

3. a. Divide these words into syllables

   connected
   control
   flowing

   b. What two rules about syllabication can you draw from the words in (a) above?

   c. Terminals — How many vowels are there in each syllable? Is there a rule you can make?

   Circuit — In light of the above rule how can you explain your division of this word?

4. Which is the main idea of the conclusion?

   a. Electricity was supplied by a dry cell.
   b. Electromagnets have a north and south pole.
   c. When electricity flows through an insulated wire that is wound around a soft iron core, the core becomes a magnet.
   d. Electromagnets are like magicians, providing the magical power of electric current.

5. Using the dictionary, determine which syllable receives the stress.

   connect
   flowing
   circuit

SCIENCE WORKSHEET LEVEL C

Newwwords: insulated, electromagnet, control, power, terminals, switch, circuit

1. Word meaning. Match each of the above words with the best statement of its meaning. Write the words in the spaces following each definition.

   a. To isolate in order to prevent contact with other objects. In this case, to prevent electricity from escaping from a wire._____

   b. A soft iron core surrounded by a coil of wire through which an electric current is passed. _____

   c. To keep within limits, guide, or direct. _____

   d. The complete path of a thing such as an electric current._____

   e. Energy or force for doing, such as leading a group or lighting a bulb. _____

f. A device for stopping or starting the flow of electricity in a circuit._____

g. A device at the end of a wire which makes electrical connections. _____

FILL IN AND COMPLETE

2. Opposite poles of magnets _____, while like poles _____

3. The two ways we increased the strength of our electromagnet were

a. _____
b. _____

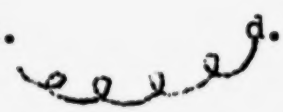
4. When we reversed the connections of the wires to the terminals we caused the electricity current to flow in an _____ direction.

5. When the _____ is closed, the current flows through the circuit.

6. The electricity to power the electromagnet was supplied by the _____.

7. A covered wire is called an _____ wire.

8. Identify each picture with its proper name.

a. b. c.  d. e. f.

a._____ b._____ c._____ d._____ e._____ f. _____